

CLAIMS

1. An optical apparatus, comprising:

a collimating device including:

a collimating portion that includes a collimating element optically coupled to an optical fiber, the collimating portion including a first engagement surface;

a core portion; and

an adapter portion that interconnects the collimating portion with the core portion, the adapter portion including a second engagement surface that movably engages with the first engagement surface of the collimating portion to enable relative motion of the core portion with respect to the collimating portion.

2. An optical apparatus as defined in claim 2, wherein the core portion contains an optical component selected from the group consisting of an optical filter, a birefringent crystal, a circulator, and an isolator.

3. An optical apparatus as defined in claim 2, wherein the collimating portion, the core portion, and the adapter portion each cooperate to define a longitudinal cavity, and wherein the collimating element, the optical fiber, and the optical component are positioned in the longitudinal cavity.

4. An optical apparatus as defined in claim 3, wherein the first and second engagement surfaces form articular surfaces that enable articular motion of the core portion with respect to the collimating portion.

5. An optical apparatus as defined in claim 4, wherein the relative motion of the core portion with respect to the collimating portion alters an optical path defined through the longitudinal cavity.

6. An optical apparatus as defined in claim 1, wherein the relative motion of the core portion includes linear movement along a longitudinally axial direction and articular movement about three orthogonal axes.

7. An optical apparatus as defined in claim 1, wherein the first engagement surface is convexly shaped, and wherein the second engagement surface is concavely shaped.

8. An optical apparatus as defined in claim 1, wherein the collimating portion, the core portion, and the adapter portion are bonded to one another after relative motion of the core portion with respect to the collimating portion is performed.

9. An optical apparatus as defined in claim 1, wherein the core portion comprises a portion of the first collimating device and a second collimating device.

10. A collimating device, comprising:

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a collimating portion that defines a first longitudinal cavity segment extending between first and second ends, the first longitudinal cavity segment containing an optical fiber that is optically coupled to a collimating lens, wherein the collimating portion first end has a shaped first engagement surface;

a core portion that defines a second longitudinal cavity segment extending between first and second ends, the second longitudinal cavity segment containing an optical component; and

an adapter portion that defines a third longitudinal cavity segment extending between first and second ends and that interconnects the collimating portion with the core portion, wherein the adapter portion second end has a shaped second engagement surface that movably engages with the first engagement surface of the collimating portion to enable relative movement between the collimating portion and the core portion before the collimating portion is bonded to the adapter portion.

11. A collimating device as defined in claim 10, wherein the adapter portion is configured to enable the core portion to engage in linear axial movement in a longitudinal direction and articular movement about three orthogonal axes with respect to the collimating portion.

12. A collimating device as defined in claim 11, wherein the core portion second end has a reduced diameter and is slidably engaged with the adapter portion first end to enable the linear axial movement in the longitudinal direction with respect to the collimating portion before the core portion is bonded to the adapter portion.

13. A collimating device as defined in claim 12, wherein the collimating portion is bonded to the adapter portion between the first and second engagement surfaces after relative movement is performed, and wherein the reduced diameter core portion second end is bonded to the adapter portion first end after relative movement is performed.

14. A collimating device as defined in claim 13, wherein the first engagement surface is annular and is convexly shaped, and wherein the second engagement surface is annular and is concavely shaped.

15. A collimating device as defined in claim 14, wherein a gap existing between the first and second engagement surfaces is minimized, and wherein a gap existing between the reduced diameter core portion second end and the adapter portion first end is minimized.

16. A collimating device as defined in claim 10, wherein the first engagement surface is annular and is concavely shaped, and wherein the second engagement surface is annular and is convexly shaped.

17. A collimating device, comprising: ³

a collimating portion that defines a first longitudinal cavity segment extending between first and second ends, the first longitudinal cavity segment containing an optical fiber that is optically coupled to a collimating lens, wherein the collimating portion first end has a shaped first engagement surface;

a core portion that defines a second longitudinal cavity segment extending between first and second ends, the second longitudinal cavity segment containing an optical component, wherein the core portion second end includes opposing flattened portions that define a tongue; and

an adapter portion that defines a third longitudinal cavity segment extending between first and second ends and that interconnects the collimating portion with the core portion, wherein the adapter portion second end has a shaped second engagement surface that movably engages with the first engagement surface of the collimating portion, and wherein the adapter portion includes a slot extending inward from the adapter portion first end to engage the tongue of the core portion, the engagement surfaces and the slot and tongue enabling relative movement between the collimating portion and the core portion before the collimating portion is bonded to the adapter portion.

18. A collimating device as defined in claim 17, wherein engagement of the slot and the tongue enables the core portion to engage in linear axial movement in a longitudinal direction and linear movement in a transverse direction with respect to the collimating portion.

19. A collimating device as defined in claim 18, wherein the engagement of the first and second engagement surfaces enable the collimating portion to engage in articular movement about three orthogonal axes with respect to the core portion.

20. A collimating device as defined in claim 19, wherein the collimating portion is bonded to the adapter portion between the first and second engagement surfaces after relative movement is performed, and wherein the core portion is bonded to the adapter portion between the slot and the tongue after relative movement is performed.

21. A collimating device as defined in claim 20, wherein the first engagement surface is annular and is convexly shaped, and wherein the second engagement surface is annular and is concavely shaped.

22. A collimating device as defined in claim 21, wherein a gap existing between the first and second engagement surfaces is minimized, and wherein a gap existing between the tongue and the slot is minimized.

23. A collimating device, comprising: u

a collimating portion that defines a first longitudinal cavity segment extending between first and second ends, the first longitudinal cavity segment containing an optical fiber that is optically coupled to a collimating lens, wherein the collimating portion first end includes opposing flattened portions that define a first tongue;

a core portion that defines a second longitudinal cavity segment extending between first and second ends, the second longitudinal cavity segment containing an optical component, wherein the core portion second end includes opposing flattened portions that define a second tongue;

a first adapter portion that defines a third longitudinal cavity segment extending between first and second ends, wherein the first adapter portion first end has a shaped first engagement surface, and wherein the first adapter portion second end defines a first slot extending longitudinally inward from the first adapter portion second end to engage the first tongue of the collimating portion; and

a second adapter portion that defines a fourth longitudinal cavity segment extending between first and second ends and that interconnects the first adapter portion to the core portion, wherein the second adapter portion second end has a shaped second engagement surface that movably engages with the first engagement surface of the first adapter portion, and wherein the second adapter portion first end includes a second slot extending longitudinally inward from the second adapter portion first end to engage the second tongue of the core portion, wherein the engagement between the first and second engagement surfaces, the first slot and first tongue, and the second slot and second tongue enable relative movement between the

collimating portion and the core portion before the collimating portion is bonded to first adapter portion and the core portion is bonded to the second adapter portion.

24. A collimating device as defined in claim 23, wherein engagement of the first slot and the first tongue enables the core portion to engage in linear axial movement in a longitudinal direction and linear movement in a first transverse direction with respect to the collimating portion.

25. A collimating device as defined in claim 24, wherein engagement of the second slot and the second tongue enables the core portion to engage in linear axial movement in a longitudinal direction and linear movement in a second transverse direction with respect to the collimating portion, the second transverse direction being orthogonal to the first transverse direction.

26. A collimating device as defined in claim 25, wherein the engagement of the first and second engagement surfaces enables the collimating portion to engage in articular movement about three orthogonal axes with respect to the core portion.

27. A collimating device as defined in claim 26, wherein the first engagement surface is annular and is convexly shaped, and wherein the second engagement surface is annular and is concavely shaped.

28. A collimating device as defined in claim 27, wherein a gap existing between the first and second engagement surfaces is minimized, wherein a gap existing between the first tongue and the first slot is minimized, and wherein a gap existing between the second tongue and the second slot is minimized.

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29. A collimating device, comprising:

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a collimating portion that defines a first longitudinal cavity segment extending between first and second ends, the first longitudinal cavity segment containing an optical fiber that is optically coupled to a collimating lens, the collimating portion first end including an increased diameter portion that defines an annular first engagement surface;

a core portion that defines a second longitudinal cavity segment extending between first and second ends, the second longitudinal cavity segment containing an optical component; and

an adapter portion that defines a third longitudinal cavity segment extending between first and second ends and that interconnects the collimating portion with the core portion, wherein the adapter portion second end defines an annular lip that extends radially inward and that defines a second engagement surface that movably engages with the first engagement surface of the collimating portion, the first and second engagement surfaces enabling relative movement between the collimating portion and the core portion before the collimating portion is bonded to the adapter portion.

30. A collimating device as defined in claim 29, wherein the engagement of the first and second engagement surfaces enable the collimating portion to engage in articular movement about three orthogonal axes with respect to the core portion.

31. A collimating device as defined in claim 30, wherein the first end of the adapter portion engages the second end of the core portion, the core portion second end having a reduced diameter.

32. A collimating assembly as defined in claim 31, wherein the increased diameter portion of the collimating portion axially extends in a longitudinal direction a specified distance along the collimating portion toward the collimating portion second end.

33. A collimating device as defined in claim 32, wherein the first engagement surface is convexly shaped, and wherein the second engagement surface is concavely shaped.